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Efficacy of combined lumbar plexus and parasacral sciatic nerve block in elderly patients undergoing hip fracture surgery: a retrospective analysis

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ABSTRACT

Aims: Hip fractures are a major cause of morbidity and mortality in the elderly population. Anesthesia management significantly affects outcomes in elderly patients. In recent years, peripheral nerve blocks have become important, especially in patients where subarachnoid blocks are contraindicated or in patients with severe pulmonary or cardiac diseases. This study aimed to retrospectively evaluate the efficacy of combined lumbar plexus block and parasacral sciatic nerve block in geriatric populations.

Methods: Data from patients over 70 years of age who underwent surgery for hip fracture and received combined lumbar plexus and parasacral sciatic nerve blocks between 2014 and 2024 were retrospectively analyzed. The efficacy of anesthesia, the need for intraoperative rescue anesthesia, and hemodynamic parameters were evaluated.

Results: The mean age of the 98 patients included in the study was 79.81±8.94 years. Most patients had concomitant chronic diseases. A total of 19 (19.94%) patients were administered fentanyl 50 mcg and propofol 0.5 mg/kg for pain at the beginning of surgery, and none of the patients who received sedoanalgesia experienced severe respiratory distress or low oxygen saturation. Anesthesia and analgesia were effectively administered, and the need for intraoperative rescue anesthesia was low. Hemodynamic parameters remained stable.

Conclusion: Combining lumbar plexus and parasacral sciatic nerve blocks is an effective anesthetic method for hip surgery in elderly patients with comorbidities. This method reduces the need for general anesthesia, provides comprehensive analgesia, and maintains hemodynamic stability.

Keywords: Hip fracture, lumbar plexus block, parasacral sciatic nerve block, elderly patients, hip arthroplasty

INTRODUCTION

Hip fractures are a significant cause of morbidity and mortality in the elderly population, with 80% of these cases occurring in women and an average age of approximately 80 years.[1] Most fractures result from trauma, with risk factors including reduced bone mineral density, lack of mobility, and chronic medication use. The global incidence of hip fractures is expected to increase significantly as the population ages, with projections suggesting an increase to more than 6 million cases annually by 2050.[2] Treatment of hip fractures in elderly patients includes both surgical and non-surgical approaches, with surgery being the preferred option to improve survival and functional outcomes. Prompt surgical intervention, ideally within 48 hours, is associated with reduced mortality and better recovery outcomes.[3]

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Nevertheless, because of the increasing incidence of intraoperative and postoperative risk factors associated with aging, postoperative pain, venous thromboembolism, pulmonary complications due to delayed mobilization, and intraoperative bleeding may occur[4] Anesthesia plays a crucial role in the management of hip fractures in elderly patients and significantly affects patient outcomes and recovery. The choice between general and regional anesthesia depends on several factors, including the patient's overall health, comorbidities, and specific circumstances of the fracture. Regional anesthesia, such as spinal or epidural anesthesia, is often preferred because it is associated with fewer postoperative complications, a lower risk of delirium, and better pain control.[5]

Although general anesthesia and neuraxial blocks have been used effectively in hip fracture surgery, peripheral nerve blocks have gained importance in recent years because of the increasing number of elderly patients with multiple chronic diseases. Peripheral nerve blocks may be necessary in cases where regional anesthesia is contraindicated or when the patient has severe pulmonary or cardiac conditions that make other types of anesthesia unsafe. With the introduction of ultrasonography in the operating room, peripheral nerve blocks are becoming more common.[6] Combining a lumbar plexus nerve block with a parasacral sciatic nerve block has shown promising results for hip surgery in elderly patients. This anesthetic approach provides comprehensive pain relief while minimizing the need for general anesthesia, which is particularly advantageous in this vulnerable population.

This study aimed to evaluate the efficacy of combined lumbar plexus block and parasacral sciatic nerve block in elderly patients. The primary outcomes evaluated were the intraoperative efficacy of anesthesia and analgesia and intraoperative rescue anesthesia (opioid and sedative consumption), and the secondary outcomes included intraoperative hemodynamic parameters.

METHODS

After ethics committee approval was obtained, patients who underwent surgery for hip fracture with combined lumbar plexus and parasacral sciatic nerve block at Erzincan Mengücek Gazi Training and Research Hospital between 2014 and 2024 were investigated (Date: 07.03.2024, Decision No: 2024-03/01). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Our hospital's electronic medical records were reviewed to identify patients meeting the following inclusion criteria: patients over 70 years of age, American Society of Anesthesia (ASA) III, frail with comorbidities, and for whom general anesthesia and neuraxial blocks were considered complicated. Patients with coagulopathy, sepsis, hepatic or renal insufficiency, local anesthetic allergy, or preexisting femoral/obturator neuropathy were excluded.

Demographic characteristics, including age, sex, weight, and ASA classification, were recorded. Major comorbidities were documented through chart review. Additionally, pre- and postblock peak heart rate and blood pressure measurements were recorded from the anesthesia sheets. Intraoperative fluid replacement, urine output, and bleeding values were also documented.

Anesthesia Protocol

All patients underwent routine cardiac monitoring after premedication with 1 mg of midazolam. Ultrasonography-guided nerve block was performed to provide adequate anesthesia and analgesia during surgery. A 40 ml mixed solution was prepared, containing 25 ml of 0.5% bupivacaine hydrochloride (5 mg/ml), 14.8 ml of 2% lidocaine hydrochloride (20 mg/ml), and 0.2 ml of adrenaline tartrate (5 µg/ml). For the sciatic nerve block, an average of 20 ml of this solution was administered via the parasacral approach, whereas for the lumbar plexus nerve block, an average of 20 ml was administered at the L2-3 and/or L3-4 levels. Block evaluation began after 20 minutes with a pinprick test. Surgical approval was granted once adequate sensory and motor blocks were achieved. During the perioperative follow-up, midazolam, fentanyl, and propofol were used as rescue anesthesia drugs as needed.

Statistical Analysis

Statistical analysis was performed via SPSS 26.0 software. Categorical variables are presented as numbers (n) and percentages (%), and continuous variables are presented as the means±standard deviations or medians (interquartile ranges). The distribution of the data was tested via the Shapiro–Wilk normality test. Data that were normally distributed were evaluated via the independent samples t test, whereas data that were not normally distributed were examined via the Mann–Whitney U test. $p< 0.05$ was considered statistically significant.

RESULTS

A total of 110 patients who underwent hip fracture surgery between May 2014 and May 2024 and received combined lumbar plexus and parasacral sciatic nerve blocks for anesthesia were included in the study. Twelve patients whose medical records were missing were excluded from the analysis. The majority of patients were over 70 years of age, with a mean age of 79.81±8.94 years. The demographic data are summarized in Table 1. A total of 19 (19.94%) patients were administered fentanyl 50 mcg and propofol 0.5 mg/kg for pain at the beginning of surgery, and none of the sedoanalgesia patients experienced severe respiratory distress or low oxygen saturation. The hemodynamic parameters recorded before and after blocking are summarized in Table 2. No anesthesia-related hemodynamic instability was observed in any patient postprocedure. Surgery commenced approximately 45 minutes after anesthesia. No motor deficits were observed in any of the patients during the 24-hour postsurgery motor control assessments. Analysis of patient comorbidities revealed that 70 (71.43%) patients had hypertension, 43 (43.88%) had chronic obstructive pulmonary disease (COPD), and 42 (42.86%) had diabetes mellitus. Postoperative analgesia requirements indicated that none of the patients needed additional opioids within the first 24 hours. Twenty-eight patients were admitted to the postanesthesia care unit (PACU) for monitoring, with none exceeding a 24-hour stay.

1. Demographic data of the study patients	
	Data
Age, y	79.81±8.94
Weight, kg	71.46±12.2
Sex, male/female	44 (44.9)/54 (55.1)
Sedoanalgesia, n, (%)	19 (19.94)
Time, min	130±21
PACU, n, (%)	28 (28.57)
Comorbidities n, (%)	
Hypertension	70 (71.43)
Chronic obstructive pulmonary disease	43 (43.88)
Diabetic	42 (42.86)
Congestive heart failure	41 (41.84)
Coronary arter disease	38 (38.78)
Arrhytmia	22 (22.45)
Cerebrovascular disease	21 (21.43)
Aortic valve stenosis	8 (8.16)

PACU: Postanesthesia care unit, Data are presented as mean±SD or No. (%), SD: Standard deviation

Table 2. Intraoperative characteristics of patients			
Intraoperative characteristics	**Mean±SD**	**Range**	**p**
SBP 1, mmHg	113.5±6.03	95-145	0.276
SBP 2, mmHg	109.67±7.47	80-140	
DBP 1, mmHg	67.17±7.55	45-95	0.566
DBP 2, mmHg	64.67±10.55	40-80	
MAP 1, mmHg	82.38±8.27	55-106	0.525
MAP 2, mmHg	79.7±10.01	50-96	
HR 1, beat/min	77.68±10.65	54-110	0.66
HR 2, beat/min	80.16±10.75	55-98	

SD: Standard deviation, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MAP: Mean arterial pressure, HR: Heart rate, Data are presented as mean±SD, $p<0.05$ is considered significant

DISCUSSION

Most patients who undergo hip arthroplasty are elderly and have poor cardiopulmonary function. While spinal anesthesia is the first choice, peripheral nerve blocks may also be appropriate to prevent complications in patients with comorbidities. Our results indicate that a lumbar plexus block combined with a parasacral sciatic nerve block can effectively serve as an anesthetic method for total hip arthroplasty, reducing early postoperative opioid requirements.

Peripheral nerve and plexus blocks can be utilized for anesthesia and postoperative pain control, either in combination with general anesthesia or epidural or spinal anesthesia. Blocks have gained popularity in recent years because of the long-lasting analgesia they provide. Additionally, compared with other types of anesthesia, nerve blocks may improve intraoperative hemodynamic stability.[7] Major hip fractures have become significant risk factors for mortality in patients over 75 years of age.[8] In our study, patients had a mean age above 75 years. Zhang et al.[9] investigated the efficacy of lumbar plexus blockade on anesthetic comfort and stress reactions in elderly hip replacement patients and reported an effective anesthetic effect, similar to our findings.

Elderly patients who undergo hip replacement have reduced compensatory capacity and organ function, and anesthesia and surgical stress may exacerbate this condition.[10] In our study, no hemodynamic instability requiring inotropic support occurred in patients who underwent block. In a comparative study with subarachnoid blocks, Ahamed et al.[11] reported significant hemodynamic instability in the subarachnoid block group but not in the lumbar plexus group.

Lumbosacral plexus structures innervate the lower limbs and trunk and contain axons of neuron receptors that connect the central nervous system to sensory and motor end organs.[12] The nature and extent of nerve injury in the brachial and lumbosacral plexuses are influenced by the mechanism and severity of the injury. Oliver-Fornies et al.[13] reported that ultrasound guidance reduced neurological complications, similar to our findings.[14] In this study, none of the patients experienced motor deficits or neurological complications.

In light of evidence for successful patient outcomes, the selected lumbar plexus block is a commonly used regional anesthesia technique during hip arthroplasty operations. Compared with general anesthesia and intraspinal block, this method provides hemodynamic stability more effectively and has more positive effects on symptomatic control, especially in the elderly patient population. Recent advances in ultrasound imaging technology have enabled more precise monitoring of anatomical structures and needle progression, significantly increasing the success rate of blocks.[15]

The choice of anesthesia in elderly patients with comorbidities requires special attention. An essential marker of the body's hemodynamics and stress is the catecholamine level. Choi et al.[16] found that elderly patients undergoing lower abdominal surgery who were given lumbar plexus block had lower catecholamine levels than those who were given general anesthesia. This suggests that lumbar plexus block might help older patients maintain their signs. Hypertension was the most common concomitant disease in this study. However, none of the patients experienced fluctuations in blood pressure. Aortic stenosis is a condition in which many forms of anesthesia may be risky in elderly patients, necessitating a sensitive approach. Despite impressive advances in anesthesiology and surgical techniques, morbidity and mortality remain high in patients with severe aortic stenosis. According to conventional wisdom, subarachnoid blockade is thought to produce immediate sympathetic blockade.[17] This may lead to a marked decrease in peripheral vascular resistance and possibly inhibition of cardiac accelerator nerves, resulting in severe and refractory hypotension, potential myocardial damage, and death in patients with aortic stenosis.[18] In our study, 8 (8.16%) patients with aortic stenosis successfully completed surgery without complications following the procedure. Gamlı et al.[19] also reported successful anesthesia with combined peripheral nerve blocks in a patient with aortic stenosis, hypertension, cerebrovascular disease, and a temporary pacemaker.

Postoperative pain control is crucial in hip arthroplasty patients, as is the choice of anesthesia during surgery. The combination of lumbar plexus block and parasacral sciatic nerve block provided effective postoperative pain relief, with minimal painkiller consumption in the first 24 hours. A recent meta-analysis revealed that, compared with control blocks, lumbar plexus blocks decreased overall opioid consumption, reduced side effects, and improved functional recovery.[20] These results emphasize the positive impact of comprehensive and rigorous pain management on patients' clinical outcomes.

Limitations

First, the fact that it is retrospective makes it difficult to compare patients as well as possible data loss. This was a single-center study, and the relatively small number of cases

may also be a limitation. In addition, successful anesthesia management in elderly patients with serious comorbid diseases was the subject of the study.

CONCLUSION

In this study, we observed that lumbar plexus block combined with parasacral sciatic block is an effective anesthetic method for hip fracture surgery in elderly patients. The block provided hemodynamic stability in the intraoperative period and reduced the need for opioids in the postoperative period. The results of the present study suggest that this anesthetic technique is a safe and effective option, especially in the elderly patient population with severe comorbidities.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Erzincan Binali Yıldırım University Faculty of Medicine Researches Ethics Committee (Date: 07.03.2024, Decision No: 2024-03/01).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee evaluation process

Externally peer reviewed.

Conflict of interest statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declare that this study received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

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